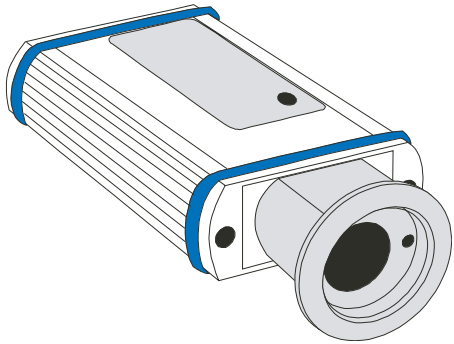
Kurt J. Lesker Company

Operating Instructions

HPT 100

High Vacuum Transmitter



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Please note:

Current operating instructions are also available at www.Lesker.com

1. Safety Instructions

- ☞ Read and follow all the instructions in this manual.
- ☞ Inform yourself regarding:
  - Hazards which can be caused by the unit
  - Hazards which can arise in your system
- ☞ Comply with all safety and accident prevention regulations.
- ☞ Check regularly that all safety requirements are being complied with.
- ☞ Take account of the ambient conditions when installing the HPT 100. The protection type is IP40/ IP 54. The unit is protected against the ingress of foreign bodies.
- ☞ Adhere to the applicable regulations and take the necessary precautions for the process media used.
- ☞ Consider possible reactions between the materials and the process media.
- ☞ Consider possible reactions of the process media due to the heat generated by the product.
- ☞ Do not carry out any unauthorised conversions or modifications on the unit.
- ☞ When returning the unit to us please note the shipping instructions.
- ☞ Before you begin to work, find out whether any vacuum components are contaminated.
- ☞ Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.
- ☞ Communicate the safety instructions to other users.

This document is based on the component software version 010500.

Pictogram Definition

Danger of an electric shock.

Danger of personal injury.

Danger of damage to the unit or system.

2. Understanding The HPT 100

2.1. For Your Orientation

Abbreviations used
HPT = Hot Cathode Pirani Transmitter
CPT = Compact Ceramic Transmitter
RPT = Resistive Piezo Pirani Transmitter
PPT = Pirani Pressure Transmitter
DPG = Digital Pressure Gauge
DPS = Digital Power Supply

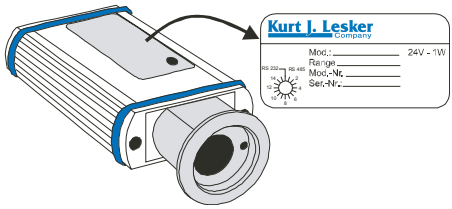
Operating Instruction In The Text
➡ Here, you have to do something.

Validity
These operating instructions describe the installation and operation of the Digital High Vacuum Transmitter HPT 100 with the part numbers KTR34130 and KTR34330. The part number is shown on the rating plate. Technical modifications are reserved without prior notification.

2.2. Product Identification

Please state the information contained on the rating plate when corresponding with the Kurt J. Lesker Company.

Product Identification HPT 100



Package Contents

The following items are included in the package:
– HPT 100
– Protective cover
– Operating instructions

2.3. Product Description

The digital Transmitter HPT 100 enables total pressure measurements in the range of 7.5 x 10^{-10} ... 750 Torr (1x10^{-9} ... 1000 mbar).

The transmitter can be operated in conjunction with the Lesker Digital Measuring and Control Units, with the Digital Power Pack and the Windows Measuring Software DokuStar (please see "Accessories") on a PC or with customer related, digital signal evaluation.

The transmitter communicates optionally via a Serial Interface RS 232 or RS 485.
The individual functions are described in more detail in the section "Communication" .

The Transmitter HPT 100 has been tested and accepted in compliance with EN 61010/VDE 0411 "Safety Equipment For Electrical Components" .

Connection Options

The HPT 100 provides connection options for:
- RS 232/485 (for communication with the display unit) or
- Voltage supply

Proper Use

The Digital Transmitter HPT 100 serves exclusively to provide total pressure measurements in the range (7.5 x 10^{-10} ... 750 Torr (1 x 10^{-9} ... 1000 mbar). It may only be connected to components specifically provided for this purpose.

Improper Use

The following is regarded as improper:
- The use for purposes not covered above and, in particular,
  - The connection to components not allowed for in their operating instructions;
  - The connection to components containing touchable, voltage carrying parts.

No liability will be accepted for claims arising from improper use.

The user bears the responsibility with respect to the process media.

3. Installation

3.1. Preparation For Installation

Unauthorized modifications or alterations to the unit are not allowed and will void the warranty.

Installation location: Indoor; max. 2000 m above mean sea level.
The following is applicable for open buildings and operations rooms which are not fully air conditioned:
Temperature: +5°C - +40°C (+ 41°F ... +100 °F)
Relative humidity: 5 - 85%, non-condensing.
Air pressure: 86 kPa - 106 kPa (12.5 psi - 15.4 psi)

3.2. Vacuum Connection

Dirt and damage have an adverse effect on the function of these vacuum components.

Please take account of the instructions with regard to cleanliness and damage prevention when using vacuum components.

Set-Up Configuration
The gauge may be mounted in any orientation. A horizontal to upright orientation is to be preffered to keep condensates and particles from getting into the measuring chamber.

Connection
➡ Remove the protective cover. Do not discard the protective cover as it is required during maintenance work.
➡ Make vacuum connection via a small flange QF16 (DN 40 KF) with version KTR34130 or DN 40 CF with version KTR34330.

Where excess pressure is involved in the vacuum system > 750 Torr (1 bar): Inadvertent opening of elements under stress can lead to parts flying around.

➡ Only use stressed elements which can be opened and closed (for example QF16 (DN 16KF) clamp).

WARNING

With excess pressure in the vacuum system of 1125 to 3000 Torr (1.5 to 4 bar): With QF (KF) flange connections elastomer washers (for example O-rings) cannot withstand the pressure and this can lead to personal injury resulting from the emission of process media.

➡ Use centering rings with an outer over pressure ring (such as the QF40-075-OPR).

3.3. Electrical Connection

CAUTION

Only connect/disconnect the cable to/from the gauge when the power is disconnected.

Kurt J. Lesker Company model DPG 101 controller:

➡ First make the connection to the Kurt J. Lesker Company DPG 101 controller by means of Data Cable, part number KT348203T (please see "Accessories") on the RS 232 Serial Interface of the controller.

➡ Rotate the transmitter address switch to RS232 operation (factory default setting). The transmitter address switch can be found on the rating plate side of the unit.

Kurt J. Lesker Company model DPS 101 power pack:

➡ To connect a transmitter to a PC, use the Kurt J. Lesker Company Power Pack Model DPS 101 and set the transmitter to RS 232.

Kurt J. Lesker Company model DPG 109 controller:

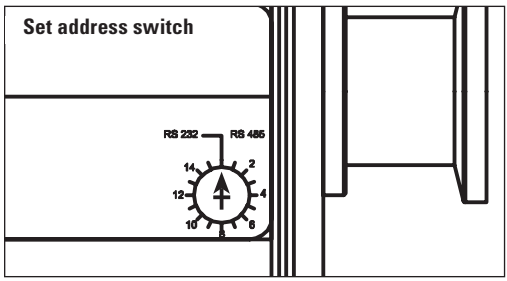
Up to nine transmitters in series can be connected to this controller.

➡ Integrate the transmitter using Data Cable part number KT348403T (please see "Accessories") into the measuring chain.

➡ Rotate the Transmitter Address switch to RS485 operation with the appropriate address. The transmitter address switch can be found on the rotating plate side of the unit (please also refer to DPG 109 Operating Instructions).

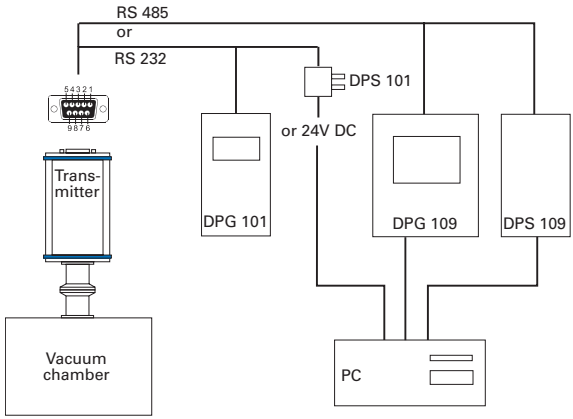
Kurt J. Lesker Company model DPS 109 power pack:

➡ To connect up to nine transmitter to a PC, use the Kurt J. Lesker Company Power Pack Model DPS 109 and set the transmitter to RS 485.

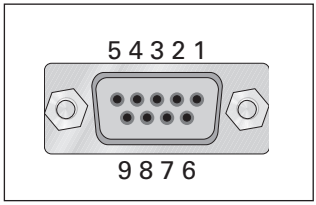


3.4. Connection Plan

Connection Plan HPT 100 (optional)



Sub-D socket arrangement on the transmitter casing



PIN	Settings
Pin 1:	n.c.
Pin 2:	RS232, RxD
Pin 3:	RS232, TxD
Pin 4:	n.c.
Pin 5:	gnd
Pin 6:	VCC
Pin 7:	RS485, D-
Pin 8:	RS485, D+
Pin 9:	n.c.

3.5. Disassembly

Possible contaminated parts.
Contaminated parts can cause personal injuries.

➡ Inform yourself regarding possible contamination before beginning work.
➡ When working with contaminated parts be sure to follow the relevant instructions and take the necessary protection measures.

Dirt and damage have an adverse effect on the function of these vacuum components.

➡ Please take account of the instructions with regard to cleanliness and damage prevention when using vacuum components.
➡ Shut down the gauge head.
➡ Disconnect the connecting cable.
➡ Detach the gauge heads from the vacuum apparatus.
➡ Place the protective cover in position.

4. Operation

4.1. General

Once voltage has been supplied the transmitter is ready to operate. A stabilization time of 5-10 minutes must be considered of. It is usually better to ensure that the transmitter remains in operation all the time.

Use Of The Filament Protective Panel
During normal UHV applications, the transmitter can be operated without the filament protection.

When applications are involved where greater levels of contamination are anticipated, the protective panel, which is included, must be used. It is important to observe the necessity for cleanliness when fitting the panel. The conductance value of the transmitter is reduced when the panel is used. In this case, operations should be restricted to 7.5×10^{-6} Torr (1×10^{-5} mbar).

The measured pressure depends on the type of gas. For matching to various types of gas a respective gas correction factor for the Pirani or Bayard-Alpert unit can be set; this generates the correct measurement value in the pressure range below 7.5×10^{-3} Torr ($1x\ 10^{-2}$ mbar). The gas type correction factor for air and N_2 has been set in the works to 1.00 (please also refer to Section 8.3."Gas Correction Factor").

The transmitter has been factory adjusted. Re-adjustment may be necessary in the event of extreme temperatures or ageing etc. and is carried out with a connected vacuum controller via the PC-Software "DokuStar" or customer specific in accordance with the communication instructions.

Please note that before equalization the transmitter must have been in operation for approximately 5 minutes (warm-up time) at the respective pressure. For correct zero point equalization, the pressure in the vacuum chamber must be below 3.75×10^{-5} Torr (5×10^{-5} mbar).

Baking out
If the bakeout temperature is higher than 60°C (140°F) the electronic unit must be removed. To avoid some mistakes the serial number of the complete unit is fixed up to the transmitter print.

4.2. Communication

The transmitter communicates via the serial interface with the respective display units (please see "Accessories"), but alternatively can also be controlled directly via the RS 232 or RS 485 by means of the interface protocol.
The Interface protocol is in ASCII format which means that all data bytes are representable symbols with an ASCII code ≥ 32 with the exception of the telegram final symbol carriage return (C_R, 13).

For example the character string and the ASCII code corresponds as follows:

0	1	2	0	0	7	4	0	0	2	=	?	1	0	8	C_R
48	49	50	48	48	55	52	48	48	50	61	63	49	48	56	13

The following possible telegrams are transferred with 9600 baud, 8 data bits, no parity and 1 stop bit.

Write request to transmitter

a1	a2	a3	1	0	p1	p2	p3	l1	l2	data	c1	c2	c3	C_R

Read request to transmitter

a1	a2	a3	0	0	p1	p2	p3	0	2	=	?	c1	c2	c3	C_R

Answer of transmitter

a1	a2	a3	1	0	p1	p2	p3	l1	l2	data	c1	c2	c3	C_R

a1, a2, a3: Unit address (“001” ... “015”, also see chapter 3.3)
p1, p2, p3: number (see table)
l1, l2: data length (see table)
data: see table or “NO_DEF”: wrong parameter number, “_LOGIC”: Access fault, “_RANGE”: Out of range
c1, c2, c3: checksum, sum of all ASCII up to checksum modulo (remainder) 256, for example “0120074002=?” => 48+49+50+ ... +61+63=620, 620 modulo 256 = 108 => “108”
C_R: Carriage return (ASCII code 13)

#	Name	writable	readable	I1, I2	Date
040 [1]	DeGas	•	•	"01"	"0": abort respectively is not activ "1": activate respectively is activ
303	Error code		•	"06"	"000000": no error "Err001": transmitter defective "Err002": memory defective
312	Software version		•	"06"	character string; six signs long
349	Transmitter type		•	"06"	".... A1" (32 32 32 32 65 49): CPT 100 ".... A2" (32 32 32 32 65 50): RPT 100 ".... A3" (32 32 32 32 65 51): PPT 100 ".... A4" (32 32 32 32 65 52): HPT 100
740	Current pressure value in mbar	• [2]	•	"06"	"aaaabb" for a.aaa · $10^{(bb-20)}$ e.g. "123423" => 1.234 · $10^{(23-20)}$ => 1.234 · 10^3 => 1234 mbar
741	Adjustment low/high pressure	•		"03"	"000": low pressure "001": high pressure
742	Correction factor (Pirani)	•	•	"06"	"abcdef" for abcd,ef e.g. "000123" => 1.23
743 [1]	Correction factor (Bayard-Alpert)	•	•	"06"	"abcdef" for abcd,ef e.g. "000123" => 1.23

[1] *only HPT 100*

[2] *see transmitter adjustment*

DeGas (only for HPT 100)
The degassing mode can be activated/canceled with a write request and the status be queried with a read request as well.
While the transmitter is in the degassing mode, no valid measuring values are transmitted.

Transmitter adjustment
To equalize a transmitter there must first be set a pressure adjustment point and then the actual pressure value. If the setting for the pressure adjustment point is missing or if another telegram is inserted between the two steps, an error signal is generated when writing the pressure value.

Handling	Telegram to Transmitter	Telegram from Transmitter
Set correction factor to 4.2 of transmitter 2	Write request to transmitter Answer (O.K)	"00210742060004200 28$^{C}_{R}$" "00210742060004200 28$^{C}_{R}$"
Read current pressure value of transmitter 12	Read request to transmitter Answer represents 4.234 10^{-5} mbar	"0120074002=?108$^{C}_{R}$" "012007400642341504 0$^{C}_{R}$"
Adjust transmitter 1 at atmosphere (high pressure)	Write request to transmitter Answer (O.K) Write request to transmitter Answer (O.K)	"0011074103001130$^{C}_{R}$" "0011074103001130$^{C}_{R}$" "0011074006100023025$^{C}_{R}$" "0011074006100023025$^{C}_{R}$"

4.3. Transmitter Equalization

Automatic alignment in the "ur" range (under range)
Starting with instrument version 010500, the alignment is run automatically while simultaneously the following conditions apply:

- the pressure of the Bayard-Alpert component is < $5.0 \cdot 10^{-5}$ mbar.
- the measured value of the Pirani component does not change for one minute and does deviate too much from the most recent calibration value.

Manually operated alignment when operations via display unit DPG 101 or DPG 109:

➡ Equalization of the transmitter as described in section 4.4. or 4.5. of the DPG instructions.

Manually operated alignment communication via RS 232 or RS 485:

➡ Evacuate the vacuum system to the pressure of $p<1 \times 10^{-5}$ mbar.
➡ Set the adjusting pressure point [P:741] to «000» for low pressure and transmit.
➡ Transmit the actual pressure value ([P:740] with «000000») for low pressure (represents $p < 1.0 \cdot 10^{-5}$); ==> ''ur'' (under Range).
➡ Vent to atmospheric pressure with air or N_2; afterwards wait about 10 minutes.
➡ Set the adjusting pressure point [P:741] to «001» for high pressure and transmit.
➡ Set the actual pressure value to the atmospheric pressure (e.g. «100023» for 1000 mbar).

5. Degas

Deposits on the electrode of the hot cathode tubes can cause instability in the measurement signals and lead also to increased desorption in the ultra high vacuum range which, in turn, can lead to a too high measured pressure.

In such cases it is desirable, at pressures of below 1.5 x 10^{-6} Torr (2 x 10^{-6} mbar), to clean the anode of the transmitter by baking out the adsorbed gas particles. This is carried out (via the connected measuring unit) by starting the Windows Software DokuStar in accordance with the
communication instructions relating to the degassing procedure. In this way the anode is warmed up by ohmic heat up to 800 °C (1500°F). Although baking out lasts approximately 3 minutes, the process can be discontinued at any time beforehand.

No transmission of measurement values is possible during the time the transmitter is in degassification mode.

6. Error Signals

Error	Possible Cause	Elimination
Transmitter does not respond	No supply voltage	Connect data cable or power pack
	Incorrect serial interface type or incorrect address set	Remove rubber stoppers on rating plate side and set address switch to the serial interface to be used and/or set the correct address (see Section 3.3.).
	Transmitter defective	Replace transmitter
A too high measuring value is printed out in the high vacuum	High transmitter degassing	Degas (see Section 5.)
	Adjustment necessary, contamination	Re-adjust (see Section 4.1.)
	Transmitter defective	Replace transmitter

7. Maintenance, Service

The unit requires no maintenance. A damp cloth can be used to wipe away any dirt. Ensure that the unit is first disconnected from the mains power supply.

Do Make Use Of Our Service Facilities

➡ "Should a defect occur on the HPT 100 contrary to expectations, please send the transmitter to the authorized service center for repair and for replacement with a new exchange unit."

Cannot be field serviced.

Please note:
Units returned to us for repair or maintenance are covered by our general conditions of sale and supply.

Products returned to the Kurt J. Lesker Company for service or repair should, if possible, be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological).

➡ Adhere to the forwarding regulations of all involved countries and forwarding companies.
➡ Enclose a completed contamination declaration.

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

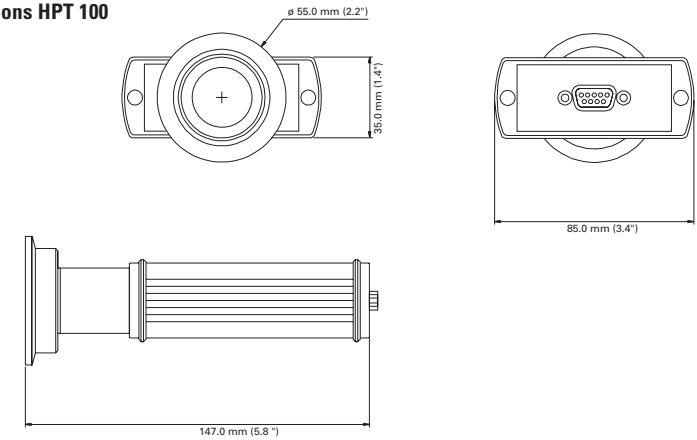
8. Technical Data

8.1. Data List

Description	Unit	Value	Comments
Measurement method		Pirani / Bayard-Alpert	
Material in contact with media		Tungsten, Stainless Steel, Nickel	
Sealing		Metal	
Feedthrough		Glass, Ceramics	
Filaments		Yttriated Iridium, double	
Number of filaments		2	
Measuring range	Torr (mbar)	7.5×10^{-10} ... 750 (1×10^{-9} ... 1000)	
Pressure	Torr (bar)	max. 4	
Repeatability % of measurement	Torr (mbar)	7.5×10^{-8} ... 0.75 (1×10^{-7} ... 1) +/- 5 %	
Accuracy % of measurement		7.5×10^{-8} ... 0.75 (1×10^{-7} ... 1) +/- 10 %	
Measuring cycles	ms	40	
Temperature: Operating:	°C (°F)	+5 ... +50 (+40 ... +120)	
Temperature: Storage	°C (°F)	-40 ... +60 (-40 ... +140)	
Temperature: Bake-out	°C (°F)	max. 356	without electronics
Supply: Voltage	VDC	24	
Supply: Power consumption max.	W	7.5	
Output		digital RS 232 / RS 485	
Serial interface		9600 baud, 8 databits, no parity, 1 stopbit	
Electrical connection		9 poles Sub-D socket, screwable	
Adjustment Pirani		with display unit or software to atmosphere and zero if pressure < $3.75 \bullet 10^{-5}$ Torr (< $5 \bullet 10^{-5}$ mbar)	
Protection type		IP 40/IP 54	
Weight	kg (lbs.)	0.4 (0.88)	
Internal volume, approx.	cm^3	1.0	
Dimensions: KTR34130 KTR34330	mm (inch) mm (inch)	147 x 85 x 35 (5.8 x 3.4 x 1.4) 156 x 85 x 35 (6.2 x 3.4 x 1.4)	incl. flange
Flange: KTR34130 KTR34330		QF16 (DN 40 KF) DN 40 CF	
Measuring cable length	m (ft)	max. 1000 (3280), only for RS 485	

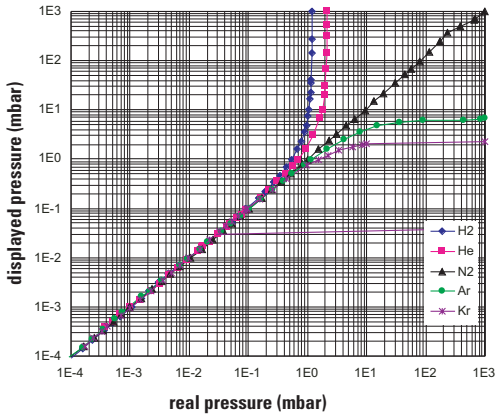
8.2. Dimensions

Dimensions HPT 100



8.3. Gas Correction Factor

Measuring diagram HPT 100 (Pirani)



Relative sensitivity in the molecular range ($1x10^{-1}$ mbar)

Correction factor Pirani	
N_2	1.00
Air	1.00
H_2	0.58
He	1.02
Ar	1.59
CO_2	0.89

Correction factor Bayard-Alpert	
He	5.93
H_2	2.39
Ar	0.80
CO_2	0.74
C_3H_8	0.32
Ne	3.50
Kr	0.60
Xe	0.41
R12	0.28

9. Accessories

Description	Unit	Pieces	Number	Comments
DPS 101, plug power pack with PC connecting cable for one transmitter		1	KTG20011	US version
DPS 109, switching power pack with integrated PC adapter for up to 9 transmitters		1	KTG25010	
DPG 101 Controller		1	KTG10010	
DPG 109 Controller		1	KTG15010	
Data cable for connection to Controller DPG 101 (RS 232)	3m (10 ft)	1	KT348203T	
Data cable for connection to Controller DPG 109 or Switching Power Pack DPS 109 (RS 485)	3m (10 ft)	1	KT348403T	
Bus termination RS 485		1	KT348100	
TIC 002 Level converter		1	KT051519AT	
Software “Dokustar “		1	KT882500	
Software “Dokustar Plus“		1	KT882501	

10. Supplementary Information

Depending on the configuration of your components further operating instructions are included in the package (please see the table). If, despite every effort by us, information on your products is missing please get in touch with your local Kurt J. Lesker Company representative or contact us using the information on the back cover page.

The following operating instructions are available for digital transmitters and accessories:

Product	Definition	No. Operating Instructions
CPT 100	Rough vacuum transmitter	PG0001KJL
PPT 100	Medium vacuum transmitter	PG0002KJL
RPT 100	Combination vacuum transmitter	PG0003KJL
HPT 100	High vacuum transmitter	PG0004KJL
DPG 101	Display unit	PG0006KJL
DPS 101	Switching power pack	PG0007KJL
DPG 109	Display unit	PG0005KJL
DPS 109	Switching power pack	PG0008KJL
TIC 002	Level Converter	PT0076KJL
Software “DokuStar Plus”	Software for PC data evaluation	PG0012KJL

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